

REVIEW

Related to a competition for the Academic position of 'Professor',
in the field of higher education

4. Natural Sciences, Mathematics and Computer Science
professional field

4.6 Informatics and Computer Sciences

with a candidate

Associate Professor Lyudmila Pavlova Todorova, Ph.D.

Prepared by Professor Olympia Nikolaeva Roeva,
Institute of Biophysics and Biomedical Engineering,
Bulgarian Academy of Sciences

Member of Scientific Jury according to the Order № 310/13.12.2024
of the Director of the Institute of Biophysics and Biomedical Engineering – Bulgarian
Academy of Sciences

The competition for the Academic position of 'Professor', in the field of higher education 4. Natural Sciences, Mathematics and Computer Science, professional field 4.6 Informatics and Computer Sciences, for the needs of the Department Bioinformatics and Mathematical Modelling, Institute of Biophysics and Biomedical Engineering (IBPhBME) – Bulgarian Academy of Sciences (BAS) is announced in State Gazette Vol. 54/12.06.2026 according to the requirements in Act on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB) and Regulations of ADASRB – IBPhBME, BAS.

Documents for participation in the competition were submitted by a candidate – Assoc. Prof. Lyudmila Todorova, Ph.D. The documents for the competition are presented in accordance with the Regulations of ADASRB – IBPhBME – BAS.

According to the ADASRB and Regulations of ADASRB and Chapter 5 from Regulations on the specific conditions for obtaining scientific degrees and for holding academic positions in IBPhBME – BAS, the candidate for the Academic position of 'Professor' Assoc. Prof. Lyudmila Todorova fully meets the specified conditions and requirements.

Assoc. Prof. Lyudmila Todorova has defended her Ph.D. thesis "Patient Condition Analysis System for Weaning from Prolonged Mechanical Ventilation", she was awarded the educational and scientific degree "Ph.D." in scientific specialty 02.21.10 "Application of the

principles and methods of cybernetics in various fields of science". Since 2011, she has been an Associate Professor, professional field 4.6 Informatics and Computer Sciences.

She works on a basic employment contract and her work experience is 40 years and 7 months, including as an Associate Professor – 15 years.

1. General description of the submitted materials regarding the research activity of the candidate

Assoc. Prof. Lyudmila Todorova participated in the competition with the 34 publications:

1. 16 publications in journals with IF
[B2, B8, B9, B10, B12, Г1, Г2, Г3, Г4, Г5, Г6, Г7, Г8, Г9, Г19, Г21];
2. 11 publications in journals with SJR
[B4, B6, B7, B11, Г10, Г11, Г12, Г13, Г14, Г15, Г16];
3. 1 book chapter
[Г22];
4. 6 publications in other journals.

Assoc. Prof. Lyudmila Todorova is the first author of 7 publications, a second author with equal contribution to the first author in 14, and the last author in 5 publications. These data give reason to consider that the candidate is the lead researcher in the presented research. Her participation in international conferences demonstrates the wide dissemination achieved for the results and her desire for active discussion with the scientific community.

The publication activity summary shows that Assoc. Prof. Lyudmila Todorova, PhD, exceeds the minimum requirements for holding the academic position of 'Professor' in accordance with the ADASRB and the Regulations for the Development of ADASRB at IBFBME – BAS (Table 1). The additional requirement of IBFBME – BAS for 15 publications in journals with an impact factor is also met. Assoc. Prof. Lyudmila Todorova, participates in the competition with 16 publications in impact factor journals.

Table 1. Scientometric indicators

Group of indicators	Minimum requirements for holding the academic position of 'Professor'	BAS minimum requirements for holding the academic position of 'Professor'	Number of points of Assoc. Prof. L. Todorova
A	50	50	50
B	100	100	144
Г	200	220	248
Д	100	100 (100 за ПИИ 4.5 и ПИИ 4.6)	2184
Е	150	150 (100 за ПИИ 4.5 и ПИИ 4.6)	190

A list of 520 citations (excluding self-citations) to publications by Assoc. Prof. Lyudmila Todorova, PhD, is presented. 208 of the citations are in Scopus and Web of Science. The presented citations satisfy the recommended scientometric indicators for citations. The

reference in the two main databases shows that the candidate has an h-index = 6 (Scopus) and an h-index = 5 (Web of Science). As of September 30, 2026, the citations (excluding self-citations) are 342 in Scopus and 224 in Web of Science.

2. Participation in research projects

According to the presented documents, Assoc. Prof. Lyudmila Todorova has participated in several scientific projects, as follows:

- Contract No. TK02-451/2009, "Computer-assisted Decision Support System for Weaning from Mechanical Ventilation in Ventilator-dependent Critically Ill Patients", 2010–2013;
- Contract No. DFNI-I-02-5/2014, "InterCriteria Analysis – A New Approach to Decision Making", 2015–2018;
- Contract No. KP-06-N22/2018, "Theoretical Studies and Applications of InterCriteria Analysis (TYPIKA)", 2018–2024;
- Contract No. KP-06-N43/2020, "Development of a Prognostic Model for Life Expectancy in Patients with Prostate Carcinoma and Refining Treatment to Improve Quality of Life", 2020–2026;
- International cooperation within the framework of inter-academic agreements (EBR), Slovakia-21: Intuitionistic Fuzzy Sets – Theory and Applications, 2021–2022;
- International cooperation within the framework of inter-academic agreements (EBR), No. IC-PL/14/2024-2025, EBR-Poland-24-25: Intuitionistic Fuzzy Sets – Theory and Applications in Various Fields, 2024–2025;
- International cooperation within the framework of inter-academic agreements (EBR), No. IC-PL/14/2026-2027, ABR, EBR-Poland-26-27: Theory and Applications of Intuitionistic Fuzzy Sets and Generalized Nets, 2026–2027;
- Development of Information System "CogniSoft", BG16RFOP002-1.005-0318/19.12.2018, OP "Innovations and Competitiveness" 2014–2020, 2018–2020;
- Procedure BG16RFOP002-1.005 Development of Product and Production Innovations. UMIS Project Number BG16RFOP002-1.005-0037-C01. Project title: "Development and Testing of a Prototype of an Innovative Module for Operational Control and Updating of Production Schedules in Open Production in a Real-Time Changing Production Environment", 2018–2020.

Assoc. Prof. Lyudmila Todorova, PhD, has successfully supervised one part-time PhD student – Aleksandar Ognyanov Marazov, on the dissertation topic 'Deep Neural Networks for Diagnostic Purposes in Medicine' (Field of Higher Education: 4. 'Natural Sciences, Mathematics and Informatics', Professional Field: 4.6. 'Informatics and Computer Sciences', Doctoral Program 'Informatics'), 2018–2024.

3. Scientific contributions

The research activity of Assoc. Prof. Lyudmila Todorova, PhD, is aimed at solving key and high-tech problems of modern bioinformatics, artificial intelligence, and mathematical modeling in medicine. The relevance and exceptional social and scientific significance of her research are determined by the need for new, high-precision methods for processing complex medical data, decision-making under uncertainty, and creating innovative computer systems

for diagnosis, monitoring, and rehabilitation. The developed approaches address critical challenges in fields such as intensive care, neurology, neurosurgery, and oncology, where proper and timely support of clinical decisions directly affects patient health and quality of life.

According to the "Extended Habilitation Report on Scientific Contributions", the contributions of Assoc. Prof. Lyudmila Todorova, PhD, are as follows:

Scientific Contributions:

1. Extension of the theory of IFS (Intuitionistic Fuzzy Sets) by introducing a new order over IFS, a new relation, and new operators for geometric interpretation, as well as a scheme for obtaining a graded intuitionistic fuzzy estimation of the information contained in Kaplan-Meier curves.
[B4_1, B4_9, Γ 7_12, Γ 7_16, Γ 7_17]
2. Extension of the theory of ICA (InterCriteria Analysis) by introducing new algorithms for calculating similarity evaluations between criteria and by introducing new modifications of ICA. The reliability of the proposed algorithms and modifications has been proven by applying them to real medical data (neurosurgery and urology) and comparing the obtained results with those from classical statistical methods.
[B4_3, B4_5, B4_8, B4_10]
3. Extension of the theory of Indexed Matrices with new approaches for their aggregation based on "full relevance", which provides an opportunity for better knowledge discovery and selection of the most informative input data.
[Γ 7_20]

Scientific and Applied Contributions:

1. Discovery of relations (consonance and dissonance) between criteria and, on this basis, decision support in medicine during diagnosis, treatment, prevention, and rehabilitation in the fields of neurology, ophthalmology, intensive care (resuscitation), and neurosurgery.
[Γ 7_4, Γ 7_5, Γ 7_6, Γ 7_7, Γ 7_8, Γ 7_9, Γ 7_10, Γ 7_11, Γ 7_18, Γ 7_19, Γ 8_1]
2. Formulation of indices for the needs of clinical practice in the fields of neurology and neurosurgery.
[B4_11, B4_12, Γ 7_1, Γ 7_2, Γ 7_3]
3. Participation in the development of the commercial computer system Rila CogniSoft for assessment and rehabilitation of neuropsychological impairments in individuals with multiple sclerosis. Based on a comparative analysis of existing solutions and methodologies, a new methodology for diagnosis and rehabilitation was created, piloted, tested, and validated. Two new approaches for evaluating neuropsychological outcomes were introduced, implemented in the Rila CogniSoft system, enabling early detection of cognitive impairment in patients with multiple sclerosis.
[B4_6, Γ 7_13]
4. Formal description of algorithms required for developing software products for medical purposes, namely: supporting clinicians' decisions in assessing the readiness

of ventilator-dependent critically ill patients for weaning from mechanical ventilation; determining the course of multiple sclerosis based on neurophysiological assessment of multimodal evoked potentials; registering, assessing, and rehabilitating cognitive impairment in individuals with multiple sclerosis.

[B4_2, B4_4, B4_7, Г7_14, Г7_15, Г7_21]

The presented scientific and scientific-applied contributions summarize long-term, systematic, and in-depth research activity at an exceptionally high academic and professional level. The scientific results of Assoc. Prof. Lyudmila Todorova, make a significant theoretical contribution to enriching and expanding the apparatus of intuitionistic fuzzy sets, intercriteria analysis, and indexed matrices. At the same time, the applied scientific achievements extend beyond theoretical models and find real implementation in medical practice and commercial software (such as the Rila CogniSoft system).

The high scientific level and recognition of the candidate are confirmed by the large number of published works in reputable journals with an impact factor and impact rank, as well as by the number of citations. The successful supervision of a PhD graduate and participation in numerous national and international research projects further demonstrate her leadership qualities and her establishment as a leading scientist in the field of informatics and computer sciences. Her research is highly relevant and carries a significant social impact.

CONCLUSION

Based on the above, I can state that **all requirements, conditions and criteria** of ADASRB, Regulations for the implementation of ADASRB, and Regulations for the implementation of ADASRB in IBPhBME – BAS **are met and I give a positive conclusion for the election of Assoc. Prof. Lyudmila Pavlova Todorova in a competition for the Academic position of ‘Professor’ in the professional field 4.6 Informatics and Computer Sciences.**

I propose to the esteemed Scientific Jury to vote on a proposal to the Scientific Council of IBPhBME – BAS to elect Assoc. Prof. Lyudmila Pavlova Todorova for the Academic position of ‘Professor’ in the field of higher education 4. Natural Sciences, Mathematics and Computer Science, professional field 4.6 Informatics and Computer Sciences.

30.09.2026 г.

Scientific Jury member:

(Prof. Olympia Roeva)